

SEE W/O 129474

Work Order ID 142455

142455

Page 1

Item ID: D350-748-243TRN

Accept

N9000040100

Setup Start *NS1*

Revision ID:

Stop *NS2*

Item Name: Crosstube Installation, High Aft

Start Date: 3/10/2016 Start Qty: 1.00 *1*

Cust Item ID:

Required Date: 3/14/2016 Req'd Qty: 1.00 *1*

Customer:

Reference: STARTED ON W/O 129474

Approvals: Process Plan: [Signature] Date: 16-3-9

Tooling:

Date: _____

Run Start *NR1*

QC: _____

Date: _____

SPC (Y/N): _____

Date: _____

Stop *NR2*

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

Draw Nbr	Revision Nbr
----------	--------------

D350-748-243

A

150

0.00

150

Large Fab

Crosstubes

Memo

0.02

Crosstubes

1-Grind machining marks

THIS WAS STARTED ON W/O 129474

IT WAS CLOSED BEFORE PRODUCT WAS FINISHED.

BL

16/03/16

190

0.00

190

Packaging

Packaging

Memo

0.00

Packaging

Identify and stock in kanban rack

Location: 1603

RECEIVE under new Batch
16-3-9

BL

16/03/16

DQA: _____ Date: _____



WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: _____ Date: _____

Work Order update only ☐

Work Order: _____ Part No. _____ NCR No. _____		DISPOSITION Rework ☐ Scrap ☐ Use-as-is ☐ Suspected Unapproved ☐		AGAINST DEPARTMENT/PROCESS Skid-tube ☐ Machining ☐ Thermoforming ☐ Large Fab ☐ Cross tube ☐ Small Fab ☐ Finishing ☐ Composite ☐ Water Jet ☐ Prod. Eng. Coord. ☐ Rec/Store/Packaging ☐ Supplier ☐ Engineering ☐ Quality ☐ Other ☐					
Date :		Step #:		QTY Effective :				MRB (QSI042) Approval Completed By Lead hand / Supervisor Approval Verification QC / QA Coordinator Approval	
Description Work Order Deviation				Disposition					
Root Cause		FAULT CATEGORY							
Environment ☐	No Re-verification ☐	Pressure/Forced ☐	Temperature/Cure ☐	Power Loss/Surge ☐	Positioned Wrong ☐				
Design ☐	Operator ☐	Bending ☐	Set-up ☐	Folio/Program ☐	Outside Dimensions ☐				
Doc/Data ☐	Offset/Setup ☐	Centre Not Concentric ☐	BOM/Route ☐	Grain ☐	Over/Under tolerance ☐				
Equip/Tooling ☐	Supplier ☐	Cracks ☐	Broken/Damage/Defect ☐	Weld ☐	Part Incorrect ☐				
Handling/Pre ☐	Training ☐	Crimp/Kink/Ripple/Wave ☐	Inspection Incomplete/Unqualified ☐	Wrong Stock Pulled ☐	Part Lost/Missing ☐				
Material ☐	Use for Testing ☐	Cuffs ☐	Contamination ☐	Out of Sequence ☐	Part Moved ☐				
Internal Transport ☐	Poor Information ☐	Crushing ☐	Countersink ☐	Off-set ☐	Drawing ☐				
Tribal Knowledge ☐	Rushing ☐	Heat Treat ☐	Cut Too Short ☐	Mislabeled ☐	Finish ☐				
LOA ☐	Product Improvement ☐	Wave/Twist in Tube ☐	Instructions Incomplete/Unclear ☐	Fit/Function ☐	Misread ☐				
Substation ☐	Process Improvement ☐	Marks/Chatter ☐	Drill Holes ☐	Misaligned/off center ☐	Turning Sequence ☐				
Past Expiry Date ☐	Manufacturing Process ☐	OTHER : _____							
Misidentified ☐	Past Due ☐								

Work Order ID 142455

Wednesday, March 09, 2016 2:58:57 PM

142455

Page 2

Item ID: D350-748-243TRN

Accept

N900040100Setup Start ***NS1***

Revision ID:

Item Name: Crosstube Installation, High Aft

Stop ***NS2***

Start Date: 3/10/2016 Start Qty: 1.00

1

Cust Item ID:

Required Date: 3/14/2016 Req'd Qty: 1.00

1

Customer:

Reference: STARTED ON W/O 129474

Approvals:

Process Plan: _____

Date: _____

Tooling: _____

Date: _____

Run Start ***NR1***

QC: _____

Date: _____

SPC (Y/N): _____

Date: _____

Stop ***NR2***Sequence ID/
Work Center IDOperation
DescriptionSet Up/
Run Hours

Tool ID

Tool #

Plan
CodeAccept
QtyReject
QtyReject
NumberInsp.
Stamp

200

QC21- Final Inspection - Work Order Release

0.00

200

QC

Memo

0.02

Quality Control

MCO
φ
MAR 21 2016

DQA: _____ Date: _____



WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: _____ Date: _____

Work Order update only ☐

Work Order: _____ Part No. _____ NCR No. _____		DISPOSITION Rework ☐ Scrap ☐ Use-as-is ☐ Suspected Unapproved ☐		AGAINST DEPARTMENT/PROCESS Skid-tube ☐ Machining ☐ Thermoforming ☐ Large Fab ☐ Cross tube ☐ Small Fab ☐ Finishing ☐ Composite ☐ Water Jet ☐ Prod. Eng. Coord. ☐ Rec/Store/Packaging ☐ Supplier ☐ Engineering ☐ Quality ☐ Other ☐					
Date :		Step #:		QTY Effective :				MRB (QS1042) Approval	
Description Work Order Deviation				Disposition				Completed By Lead hand / Supervisor Approval Verification QC / QA Coordinator Approval	
Root Cause		FAULT CATEGORY							
Environment ☐	☐	No Re-verification ☐	Pressure/Forced ☐	Temperature/Cure ☐	Power Loss/Surge ☐	Positioned Wrong ☐			
Design ☐	☐	Operator ☐	Bending ☐	Set-up ☐	Folio/Program ☐	Outside Dimensions ☐			
Doc/Data ☐	☐	Offset/Setup ☐	Centre Not Concentric ☐	BOM/Route ☐	Grain ☐	Over/Under tolerance ☐			
Equip/Tooling ☐	☐	Supplier ☐	Cracks ☐	Broken/Damage/Defect ☐	Weld ☐	Part Incorrect ☐			
Handling/Pre ☐	☐	Training ☐	Crimp/Kink/Ripple/Wave ☐	Inspection Incomplete/Unqualified ☐	Wrong Stock Pulled ☐	Part Lost/Missing ☐			
Material ☐	☐	Use for Testing ☐	Cuffs ☐	Contamination ☐	Out of Sequence ☐	Part Moved ☐			
Internal Transport ☐	☐	Poor Information ☐	Crushing ☐	Countersink ☐	Off-set ☐	Drawing ☐			
Tribal Knowledge ☐	☐	Rushing ☐	Heat Treat ☐	Cut Too Short ☐	Mislabeled ☐	Finish ☐			
LOA ☐	☐	Product Improvement ☐	Wave/Twist in Tube ☐	Instructions Incomplete/Unclear ☐	Fit/Function ☐	Misread ☐			
Substation ☐	☐	Process Improvement ☐	Marks/Chatter ☐	Drill Holes ☐	Misaligned/off center ☐	Turning Sequence ☐			
Past Expiry Date ☐	☐	Manufacturing Process ☐	OTHER :						
Misidentified ☐	☐	Past Due ☐							

SEE w/o 142455

Work Order ID 129474

February-11-15 3:23:26 PM

129474

~~PRELIMINARY ISSUE~~

Item ID: D350-748-243TRN

Accept

Revision ID: PRELIM

N900040100

Setup Start

NS1

Item Name: Crosstube Installation, High Aft

Stop

NS2

Start Date: 2/11/15 Start Qty: 1.00

1

Cust Item ID:

Required Date: 3/04/15 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals: Process Plan: W

Date:

Tooling:

Date:

Run Start

NR1

QC:

Date:

SPC (Y/N):

Date:

Stop

NR2

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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Draw Nbr

Revision Nbr

DAS

D350-748-243

PAZ Rev A

9
9-89

0.00

105

105

Purchasing

0.00

Purchasing

Memo

ISSUE PO TO TUBE HOLLOW

PO 27398

EXTRUDED TUBE D6021 REV. PA5

17-4 H1025 SEAMLESS STEEL TUBE AS PER ASTM A564

SIZE 2.378"OD X 2.00"ID X 125"LONG

MIN UTS = 155KSI

MIN YTS = 145KSI

TURN PER DRWG D350-748-243 REV.PA2

1-Fill tube with sand & install plugs on both ends as per Folio

2-Turn first side as per Folio

3- File transition lines smooth.

4-Turn second side as per Folio

5- File transition lines smooth.

6-Scribe Part & Batch as per Dwg D350-748-243

PER DRWG - FINISH LENGTH AFTER TURNING = 124.70 +/- 0.06

-CD 15/02/12 ①

Work Order ID 129474

129474

Page 2

February-11-15 3:23:26 PM

Item ID: D350-748-243TRN Accept ***N900040100*** Setup Start ***NS1***
 Revision ID: PRELIM Stop ***NS2***
 Item Name: Crosstube Installation, High Aft
 Start Date: 2/11/15 Start Qty: 1.00 ***1*** Cust Item ID:
 Required Date: 3/04/15 Req'd Qty: 1.00 ***1*** Customer:
 Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____ Run Start ***NR1***
 QC: _____ Date: _____ SPC (Y/N): _____ Date: _____ Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
115	Receive & Inspect for Damage & Mat'l Certs	0.00							
115									
Packaging	Memo	0.00							
Packaging									
130	QC1 - Inspect dimensions to dimension sheet	0.00							
130	QC1								
QC	Memo	0.00							
Quality Control									
150	Large Fab	0.00							
150									
Crosstubes	Memo	0.00							
Crosstubes	1-Grind machining marks								

CD 15/04/14 ①

① 15-09-17 DAS 9 9-89

Work Order ID 129474

129474

Page 3

February-11-15 3:23:26 PM

Item ID: D350-748-243TRN

Accept

N900040100

Setup Start

NS1

Revision ID: PRELIM

Item Name: Crosstube Installation, High Aft

Stop

NS2

Start Date: 2/11/15 Start Qty: 1.00

1

Cust Item ID:

Required Date: 3/04/15 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

Run Start

NR1

QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Stop

NR2

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
190		0.00							
190	Packaging								
Packaging	Memo	0.00							
Packaging	Identify and stock in kanban rack Location: _____								
200		0.00							
200	QC21- Final Inspection - Work Order Release								
QC	Memo	0.00							
Quality Control									

CL15104114

POSITIVE RECALL
EFFECTIVE 2-07-11 AUTH ll
RELEASED 15-12-79 DATE 9
DAS
9-89

Rev A

ECN15-547

Picklist Print

February-11-15 3:23:25 PM

Page 1

Work Order ID: 129474

129474

Parent Item: D350-748-243TRN

D350-748-243TRN

Parent Item Name: Crosstube Installation, High Aft

Start Date: 2/11/15

Required Date: 3/04/15

Start Qty: 1.00

Required Qty: 1.00

Comments: IPP Rev: PRELIM New Issue LL 12.05.08

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D350-748-243TRNP		Purchased	No				Each	0.0000		1			
D350-748-243TRNP									**			<u>CL 15/04/14</u>	
Crosstube Material - 17-4PH													
D6021-125P		Purchased	No				Each	0.0000		1			
D6021-125P									**			<u>CL 15/04/14</u>	
Crosstube Material - 17-4PH													

B 127272

Item	Qty	Part Number	Description
	-243		
1	X	D350-748-243	CROSSTUBE ASSEMBLY (AS 350/355 HI AFT)
2	1	D6021-125	CROSSTUBE (OR D6021-125)
3	2	D3502-1	SUPPORT
4	2	D5123-7	CLAMP CUSHION
5	1	AETC-1032	INSERT
6	1	NAS1149C0363R	WASHER (OR AN960C10)
7	2	MS21920-20 OR MS21920-21/22	CLAMP (PER DART SPEC. M-MS21920-20/-21/-22)
8	1	AN526C1032R9	SCREW
9	A/R	PROSEAL 890 B-2	SEALANT, AMS-S-8802 CLASS B-2

GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6021-125
FINISHED LENGTH AFTER TURNING = 124.70±0.08 (AFTER BENDING/TRIMMING = 122.70 REF)
- 2) FINISH: PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
PAINT OUTSIDE PER DART QSI 005 4.2
- 3) TOLERANCE: PER DART QSI 018 UNLESS OTHERWISE NOTED.
WALL THICKNESS ECCENTRICITY PER DART QSI 038 7.2
MIN. ALLOWABLE WALL IS -0.020 FROM NOMINAL
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- 6) IDENTIFICATION: DART PART NUMBER "D350-748-243" AND BATCH NUMBER ON INSIDE OF CUFF
PER DART QSI 044 6.4 (VIBRATING STYLUS)
- 7) WEIGHT: 29.85 lbs
- 8) PART IS SYMMETRIC ABOUT CENTERLINE, EXCEPT FOR Ø0.290 HOLE.
- 9) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO CRACKING/CHIPPING/GROOVES.

TURNING

- 10) BLEND OUT ALL EDGES FROM MACHINING LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH. NOTE: ALL HOLES ARE DRILLED AFTER BENDING.

BENDING

- 11) BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES PER SIDE. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D. ON TOP HALF OF BEND, AND 7% ON BOTTOM HALF OF BEND.
- 12) MAX AMPLITUDE OF RIBBLING ALONG BENT PORTION OF THE TUBE IS 0.030 (ZN A1-3)
- 13) MAX TWIST: WITH XTUBE LAYED FLAT ON SURFACE, THE DIFFERENCE BETWEEN CUFF HEIGHTS FROM THE SURFACE MAY BE NO LARGER THAN 0.38 (ZN C1-3).

ASSEMBLY

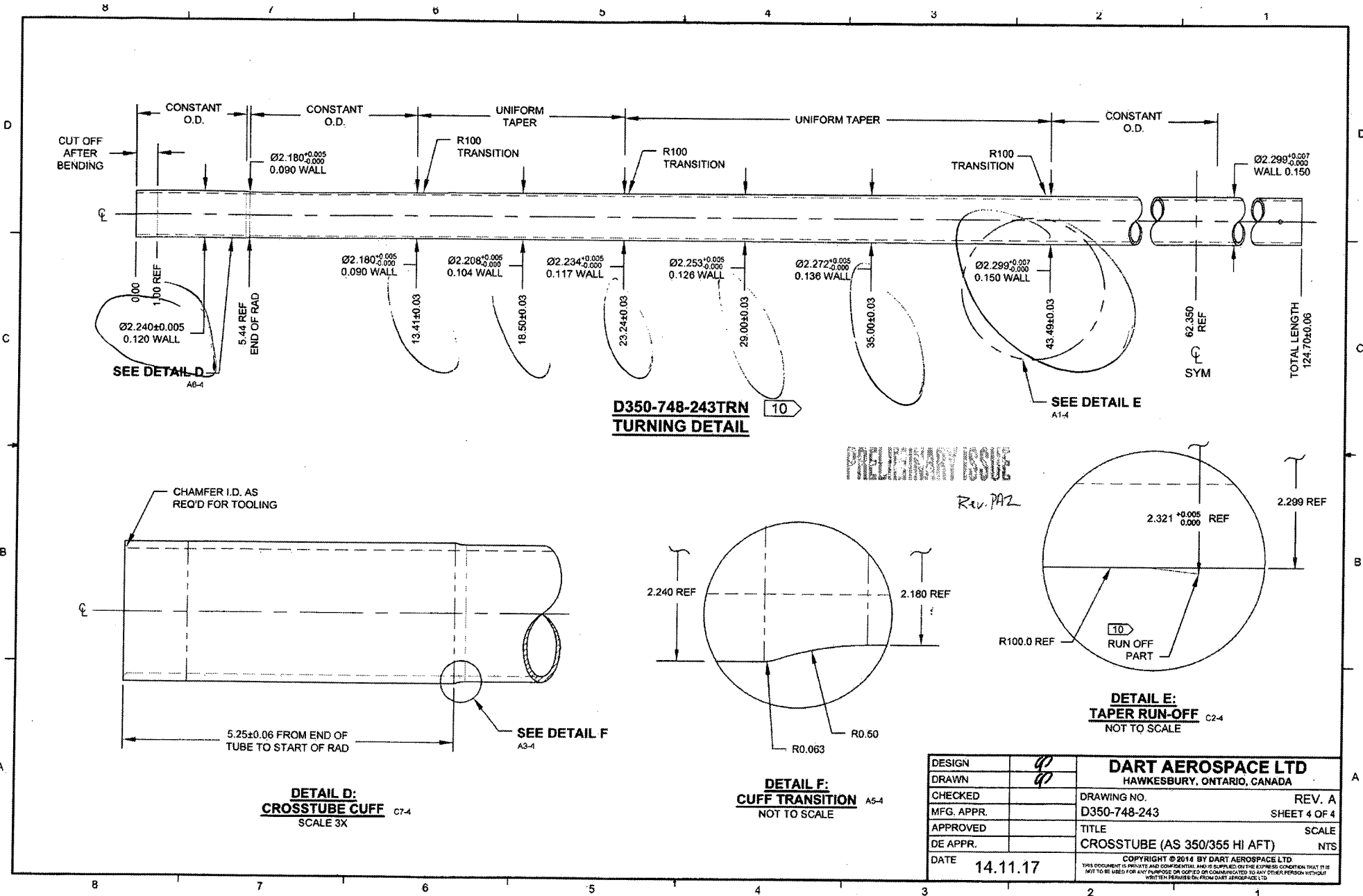
- 14) TO INSTALL D3502-1 SUPPORT: ABRASE MATING SURFACE OF SUPPORT AND CROSSTUBE WITH 180-GRIT SANDPAPER AND REMOVE RESIDUE WITH MEK (OR EQUIVALENT). APPLY A 0.02" TO 0.05" THICK LAYER OF PROSEAL 890 CLASS B-2 (OR AMS-S-8802 CLASS B-2) SEALANT TO MATING SURFACE OF SUPPORT.
- 15) TORQUE CLAMPS 80 TO 80 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING. PRIOR TO PACKAGING, RE-CHECK TORQUE ON CLAMPS AFTER PROSEAL 890 SEALANT HAS CURED FOR 72 HOURS.

**PRELIMINARY
ISSUE**

Rev. PAZ 4/14/17

DESIGN	NEW ISSUE	CP	14.11.17
REV.	DESCRIPTION	BY	DATE
DRAWN			
CHECKED			
MFG. APPR.			
DE APPR.			
DATE	14.11.17		

DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA	
DRAWING NO. D350-748-243	REV. A SHEET 1 OF 4
TITLE CROSSTUBE (AS 350/355 HI AFT)	SCALE NTS
COPYRIGHT © 2014 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.	



DESIGN		DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA	
DRAWN			
CHECKED		DRAWING NO.	REV. A
MFG. APPR.		D350-748-243	SHEET 4 OF 4
APPROVED		TITLE	SCALE
DE APPR.		CROSSTUBE (AS 350/355 HI AFT)	NTS
DATE	14.11.17	COPYRIGHT © 2014 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR REPRODUCED OR IN ANY OTHER MANNER WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.	

PACKING LIST



39 Enterprise Drive # 2 Windham, ME 04062
Phone 207.892.8899 Fax 207.892.8863

Packlist ID: 01303
Date: 4/2/2015
Page: 1

Sold To Address

DART AEROSPACE LTD.
1270 ABERDEEN ST.
HAWKESBURY K6A 1K7
CANADA

Ship To Address

DART AEROSPACE LTD.
1270 ABERDEEN ST.
HAWKESBURY K6A 1K7
CANADA

			CUSTOMER PO		PAYMENT TERMS		F.O.B.	
			PO27398		Net 30		WINDHAM	
SALES REP ID			SHIPPING METHOD		SHIP DATE		OUR ORDER NUMBER	
			JOURNEY FREIGHT		4/2/2015		DAR150049	
QUANTITY								
ORD	SHP	BCK	PART ID	DESCRIPTION				

1.00 1.00 0.00

NON RECURRING ENGINEERING

Drawing:

Rev No.:

Unit of Measure: EA

Legacy Part No.:

1.00 1.00 0.00

CROSSTUBE, FWD

Drawing:

Rev No.:

Unit of Measure: EA

Legacy Part No.:

1 PIECE OF TUBE HOLLOW INTERNATIONAL SUPPLIED 17-4 PH MATERIAL.

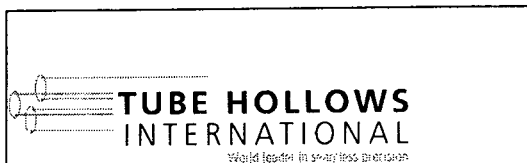
THE INITIAL MACHINING OF THE OD AND ID WERE DONE UNDER THI WO#:
141016/03 & DART PO#: PO24911 L/I 2.

S/N(S): T8D WAS CONVERTED TO PART# D350-748-143TRNP

THANK YOU FOR THIS ORDER.

RECEIVED BY: C 2/15/04/17

PACKING LIST



39 Enterprise Drive # 2 Windham, ME 04062
Phone 207.892.8899 Fax 207.892.8863

Packlist ID: 01303
Date: 4/2/2015
Page: 2

Sold To Address

DART AEROSPACE LTD.
1270 ABERDEEN ST.
HAWKESBURY K6A 1K7
CANADA

Ship To Address

DART AEROSPACE LTD.
1270 ABERDEEN ST.
HAWKESBURY K6A 1K7
CANADA

			CUSTOMER PO		PAYMENT TERMS		F.O.B.	
			PO27398		Net 30		WINDHAM	
SALES REP ID			SHIPPING METHOD		SHIP DATE		OUR ORDER NUMBER	
			JOURNEY FREIGHT		4/2/2015		DAR150049	
QUANTITY								
ORD	SHP	BCK	PART ID	DESCRIPTION				

1.00 1.00 0.00

CROSSTUBE, AFT
Drawing:
Unit of Measure: EA
Legacy Part No.:

Rev No.:

1 PIECE OF TUBE HOLLOWS INTERNATIONAL SUPPLIED 17-4 PH MATERIAL.

THE INITIAL MACHINING OF THE OD AND ID WERE DONE UNDER THI WO#:
141016/03 & DART PO#: PO24911 L/I 2.

S/N(S): B8F2 WAS CONVERTED TO PART# D350-748-243TRNP

THANK YOU FOR THIS ORDER.

RECEIVED BY:

C 2/15/04/14



STATEMENT OF CONFORMANCE

Dart Aerospace Ltd.
1270 Aberdeen
Hawkesbury, ON K6A 1K7

Part #: D350-748-243TRNP ✓
Material: 17-4 PH
Report #: 5083150
Heat #: 053468
Drawing #: D350-748-243 Rev A
P.O #: PO27398 L1 5
THI WO#: 150314/01
Qty: 1

SN: B8F2

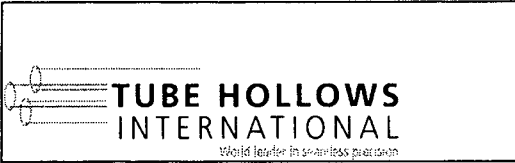
The above-mentioned parts have been inspected and conform to customer contract, purchase order, drawing, and other required specifications. All exceptions are noted below. Inspection data and all certifications are kept on file and available for review upon customer request.

Comments: Part is tagged for oversize OD in several places as marked on part.

Inspected / Certified By: Tom Bowker

Tom Bowker, Quality Dept. April 2, 2015

PACKING LIST



39 Enterprise Drive # 2 Windham, ME 04062
Phone 207.892.8899 Fax 207.892.8863

Packlist ID: 01302
Date: 4/2/2015
Page: 1

Sold To Address

DART AEROSPACE LTD.
1270 ABERDEEN ST.
HAWKESBURY K6A 1K7
CANADA

Ship To Address

DART AEROSPACE LTD.
1270 ABERDEEN ST.
HAWKESBURY K6A 1K7
CANADA

			CUSTOMER PO		PAYMENT TERMS		F.O.B.	
			24911		Net 30		WINDHAM	
SALES REP ID			SHIPPING METHOD		SHIP DATE		OUR ORDER NUMBER	
EVAN			CUSTOMER TRUCK		4/2/2015		DAR140195	
QUANTITY								
ORD	SHP	BCK	PART ID	DESCRIPTION				

56.00 2.00 16.00 D6021-125P

CROSSTUBE
Drawing:
Unit of Measure: EA
Legacy Part No.:

Rev No.:

2 PIECES OF TUBE HOLLOW INTERNATIONAL SUPPLIED 17-4 PH MATERIAL.

THE INITIAL MACHINING OF THE OD AND ID WERE DONE UNDER THI WO#:
141016/03 & DART PO#: PO24911 L/I 2.

THESE TWO PIECES WERE USED TO FULFILL L/I 4 & 5 OF DART PO#: PO27398.

S/N(S): T8D WAS CONVERTED TO PART# D350-748-143TRNP

S/N(S): B8F2 WAS CONVERTED TO PART# D350-748-243TRNP

THANK YOU FOR THIS ORDER.

CL15/04/14

RECEIVED BY: _____



STATEMENT OF CONFORMANCE

Dart Aerospace Ltd.
1270 Aberdeen
Hawkesbury, ON K6A 1K7

Part #: D6021-125P ✓
Material: 17-4 PH
Report #: 5083150
Heat #: 053468
Drawing #: D6021 Rev. PA5
P.O #: PO24911 L/I 2
THI WO#: 141016/03
Qty: 2

SN: T8D, B8F2

The above-mentioned parts have been inspected and conform to customer contract, purchase order, drawing, and other required specifications. All exceptions are noted below. Inspection data and all certifications are kept on file and available for review upon customer request.

Comments: This is a partial shipment under this P.O.

Inspected / Certified By: Tom Bowker

Tom Bowker, Quality Dept. March 25, 2015

**VALBRUNA**SLATER STAINLESS, INC.
2400 TAYLOR STREET WEST - PO BOX 630
FORT WAYNE IN 46802 USA
PHONE 260.434.2800 - FAX 260.434.2801**Product Certification Report**Report Number: **5083150**

Certified on Dec 04, 2014 Page 1 of 2

Order I.D. 1402065 001		Order Date 7/31/14		Commodity Code	
Dim 1 2.5000	Dim 2 .0000	Dim 3 .0000	Heat I.D. 053468	Customer I.D. 001417	Customer Purchase Order P011200
Product Shape Rounds			Product Surface HR & Rough Turned		Customer Grade 17-4
Length (Inches) 132.000 Min. 156.000 Max.			Bill of Lading # 423604	Weight	

Ship To

Attention: Penn Stainless Prod
Tube Hollows International
39 Enterprise Dr.
Suite 2
Windham, ME 04062

Sold To

VALBRUNA STAINLESS, INC.
2400 TAYLOR STREET WEST
FORT WAYNE, IN 46802

Lifts: 0034 0035

Condition H-1025

ASTMA 564-13

MS-17-4H1025

CHEMICAL ANALYSIS

C	Mn	P	S	Si	Cr	Ni	Mo	Cu	N	Cb	Ta	Cb+Ta
.035	.64	.027	.025	.43	15.66	4.37	.25	3.26	.04	.26	.010	.270

ROCKWELL HARDNESS ASTM E18-14

HRC
35.0

TENSILE PROPERTIES ASTM E8-13a

TS (PSI)	.2%YS (PSI)	%EL(2")	%RA
161100	150100	21.0	59.4

CHARPY V NOTCH E23-12c

TEMP	FT/LB	FT/LB	FT/LB	LAT EX	LAT EX	LAT EX	AVG FT LB	AVG LAT EX
70	86	78	79	32	40	33	81	35

TEST(F)
70

MAGNETIC PARTICLE TEST AMS2303

FREQ SEV
AVG .00 .00

PRODUCTION HEAT TREATMENT

SOL-ANN(F)	SOL-ANN(HR)	QUENCH	AGE(F)	AGE(HR)	QUENCH
1900	6.00	Air	1025	4	Air

MACRO ASTM E340-13/E381-01

MACRO
OK

PERCENT FERRITE (AMS 2315)

% FERRITE	Etchant	Magnification X
AVG .3	Marbles	100

ULTRASONIC TEST (ASTM A388)

OK

Free of mercury and low melting alloy contamination.
No welding or weld repair done.
Tensile specimen size .505".
Reduction ratio exceeds 5 To 1.

Results relate only to the items tested. Certification shall not be reproduced except in full, without written approval of Valbruna Stainless Inc. The recording of false, fictitious, or fraudulent statements on this document may be punished as a felony under federal statutes. Including Federal law Title 18, Chapter 47. Consult material safety data sheet (MSDS) for hazard info. I hereby certify that the reported figures are correct as contained in the records of the corporation.

Manager Laboratory Services

email: DHackett@valbruna.us

Dennis Hackett

**VALBRUNA**SLATER STAINLESS, INC.
2400 TAYLOR STREET WEST - PO BOX 630
FORT WAYNE IN 46802 USA
PHONE 260.434.2800 - FAX 260.434.2801**Product Certification Report**Report Number: **5083150**

Certified on Dec 04, 2014 Page 2 of 2

Order I.D. 1402065 001		Order Date 7/31/14		Commodity Code			
Dim 1 2.5000	Dim 2 .0000	Dim 3 .0000	Heat I.D. 053468	Customer I.D. 001417	Customer Purchase Order P011200		
Product Shape Rounds			Product Surface HR & Rough Turned			Customer Grade 17-4	
Length (Inches) 132.000 Min. 156.000 Max.			Bill of Lading # 423604	Weight			

**Ship
To****Attention: Penn Stainless Prod
Tube Hollows International
39 Enterprise Dr.
Suite 2
Windham, ME 04062****Sold
To****VALBRUNA STAINLESS, INC.
2400 TAYLOR STREET WEST
FORT WAYNE, IN 46802**

Specimen tested at longitudinal, mid-radius, room temperature.

Ultrasonic tested to ASTM A388 - Satisfactory.

Melted in Italy per DFARS clause 225.872-1.

Chemical testing to one or more of the listed ASTM methods:

E415-14, E1019-11, E1086-14.

Location of tensile fracture: inside middle of gage length.

No mercury or low melting alloy contamination. No weld repair.

Material melted and manufactured in the United States.

Material conforms to listed specifications and is DFARS compliant.

Quality system is compliant with ISO 9001:2008. Produced in accordance with EN 10204 3.1.

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Manager Laboratory Services

email: DHackett@valbruna.us

Dennis Hackett

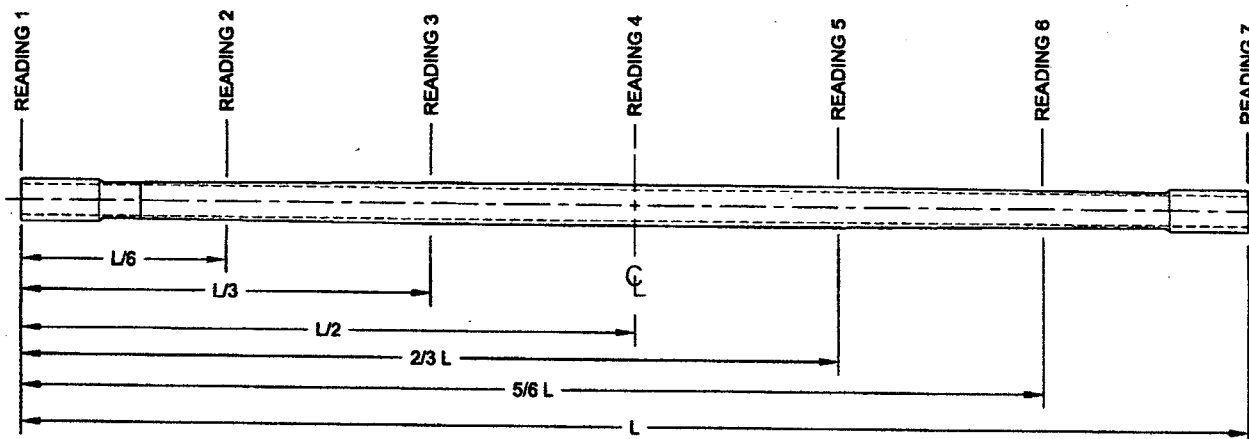
DART AEROSPACE LTD		Work Order:	
Description: Crosstube Assembly (AS350/355 High Aft)		Part Number:	D350-748-241
Inspection Dwg: D350-748-241 Rev: H			Page 1 of 2

FIRST ARTICLE INSPECTION CHECKLIST

	Inspection Sheet Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	2.240	+0.005/-0.000	2.239	-	-	vern	CNC-08
	2.180	+0.005/-0.000	2.182	-	-		
	2.180	+0.005/-0.000	2.186	-	-		
	2.208	+0.005/-0.000	2.216	-	-		
	2.234	+0.005/-0.000	2.234	-	-		
	2.253	+0.005/-0.000	2.261	-	-		
	2.272	+0.005/-0.000	2.281	-	-		
	2.299	+0.005/-0.000	2.302	-	-		
	0.063	+/-0.010	.063	-	-	vern	CNC-08
	5.25	+/-0.060	5.25	-	-	II	
	R0.063	+/-0.010	.063	-	-	RG	
	R0.50	+/-0.030	.500	-	-	II	
SIDE B	2.240	+0.005/-0.000	2.237	-	-	vern	CNC-08
	2.180	+0.005/-0.000	2.180	-	-		
	2.180	+0.005/-0.000	2.182	-	-		
	2.208	+0.005/-0.000	2.201	-	-		
	2.234	+0.005/-0.000	2.240	-	-		
	2.253	+0.005/-0.000	2.259	-	-		
	2.272	+0.005/-0.000	2.278	-	-		
	2.299	+0.005/-0.000	2.301	-	-		
	0.063	+/-0.010	.063	-	-	vern	CNC-08
	5.25	+/-0.060	5.25	-	-	II	
	R0.063	+/-0.010	.063	-	-	RG	
	R0.50	+/-0.030	.500	-	-	II	
	124.70	+/-0.060	124.70	-	-	tape	LG-11

DART AEROSPACE LTD		Work Order:	
Description: Crosstube Assembly (AS350/355 High Aft)		Part Number:	D350-748-241
Inspection Dwg: D350-748-241 Rev: H		Page 2 of 2	

WALL THICKNESS MEASUREMENT



Location	WALL THICKNESS MEASUREMENT (IN)				Deviation Δw (max-min)	TOLERANCE
	w1	w2	w3	w4		
READING 1 L= 0"	.125	.125	.125	.124	.001	0.030"
READING 2 L= 21	.114	.122	.123	.118	.009	
READING 3 L= 42	.158	.154	.154	.155	.004	
READING 4 L= 62	.154	.157	.158	.157	.004	
READING 5 L= 83	.155	.156	.155	.155	.001	
READING 6 L= 104	.120	.117	.116	.120	.004	
READING 7 L= 124	.127	.125	.125	.127	.002	

Calibration Result

Actual Block Thickness: .100 .500

Sitescan 250 Measured Thickness: .100 .500

Measured by:	<i>[Signature]</i>
Date:	15/02/11

Audited by:	<i>[Signature]</i>
Date:	15/02/11

Preliminary Approval:	
Date:	

Rev	Date	Change	Revised by	Approved
B	12.02.02	Dwg Rev updated (P/O D350-748-201)	KJ	
C	12.06.04	Wall thickness form added	KJ	
D	13.02.27	Dimension 5.25 was 4.26	KJ	
E	14.04.25	122.70 dimension revised to 124.70	KJ	
F	15.04.14	Dwg Rev updated	KJ	<i>[Signature]</i>

Item	Qty -243	Part Number	Description
1	X	D350-748-243	CROSSTUBE ASSEMBLY (AS 350/355 HI AFT)
2	1	D6021-125	CROSSTUBE
3	2	D3502-1	SUPPORT
4	2	D5123-7	CLAMP CUSHION
5	1	AETC-1032	INSERT
6	2	MS21920-20 OR MS21920-21/-22	CLAMP (PER DART SPEC. M-MS21920-20/-21/-22)
7	1	NAS1149C0363R	WASHER (OR AN960C10)
8	1	NAS1635-3-8	SCREW (OR MS51958-63)
9	A/R	PROSEAL 890 B-2	SEALANT, AMS-S-8802 CLASS B-2

GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6021-125
FINISHED LENGTH AFTER TURNING = 124.70±0.06 (AFTER BENDING/TRIMMING = 122.70 REF)
- 2) FINISH: PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
PAINT OUTSIDE PER DART QSI 005 4.2
- 3) TOLERANCE: PER DART QSI 018 UNLESS OTHERWISE NOTED.
WALL THICKNESS ECCENTRICITY PER DART QSI 038 7.2
MIN. ALLOWABLE WALL IS -0.020 FROM NOMINAL
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- 6) IDENTIFICATION: DART PART NUMBER "D350-748-243" AND BATCH NUMBER ON INSIDE OF CUFF
PER DART QSI 044 6.4 (VIBRATING STYLUS)
- 7) WEIGHT: 29.85 lbs
- 8) PART IS SYMMETRIC ABOUT CENTERLINE, EXCEPT FOR Ø0.290 HOLE.
- 9) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO CRACKING/CHIPPING/GROOVES.

TURNING

- 10) BLEND OUT ALL EDGES FROM MACHINING LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH. NOTE: ALL HOLES ARE DRILLED AFTER BENDING.

BENDING

- 11) BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES PER SIDE. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D. ON TOP HALF OF BEND, AND 8% ON BOTTOM HALF OF BEND.
- 12) MAX AMPLITUDE OF RIPPLING ALONG BENT PORTION OF THE TUBE IS 0.030 (ZN A1-3)
- 13) MAX TWIST: WITH XTUBE LAYED FLAT ON SURFACE, THE DIFFERENCE BETWEEN CUFF HEIGHTS FROM THE SURFACE MAY BE NO LARGER THAN 0.38 (ZN C1-3).

ASSEMBLY

- 14) TO INSTALL D3502-1 SUPPORT: ABRASE MATING SURFACE OF SUPPORT AND CROSSTUBE WITH 180-GRIT SANDPAPER AND REMOVE RESIDUE WITH MEK (OR EQUIVALENT). APPLY A 0.02" TO 0.05" THICK LAYER OF PROSEAL 890 CLASS B-2 (OR AMS-S-8802 CLASS B-2) SEALANT TO MATING SURFACE OF SUPPORT.
- 15) TORQUE CLAMPS 60 TO 80 IN.-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING. PRIOR TO PACKAGING, RE-CHECK TORQUE ON CLAMPS AFTER PROSEAL 890 SEALANT HAS CURED FOR 72 HOURS.

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2015 MAR 18

4/ ECN 15-547

UNDER REVIEW

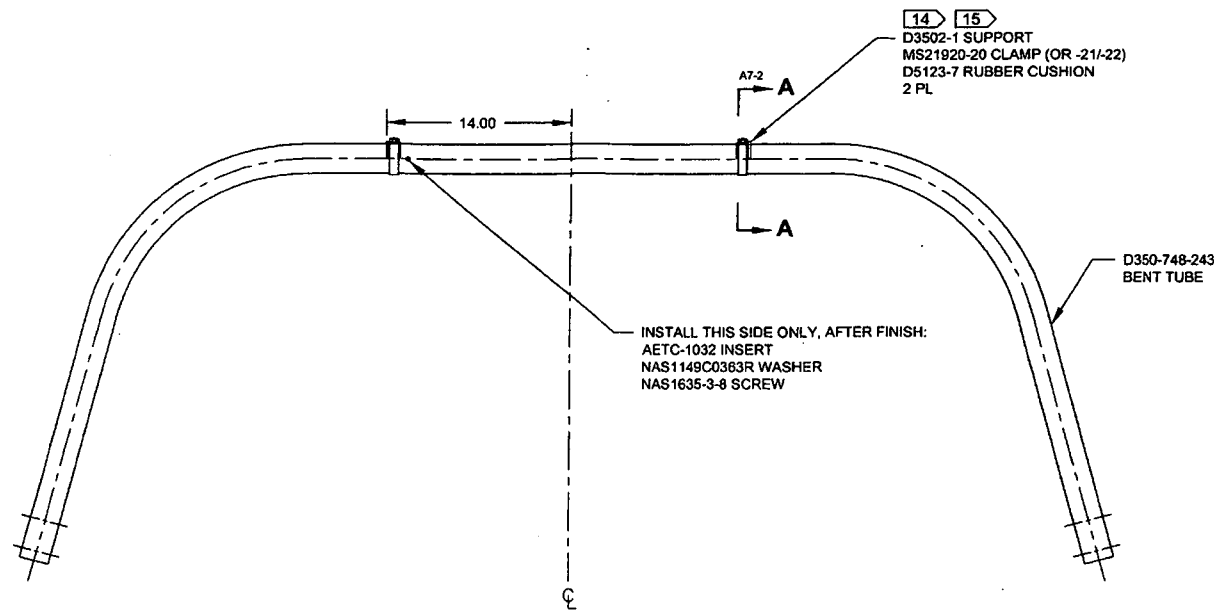
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LRF 15-541

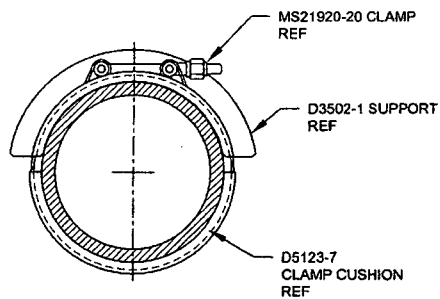
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DART AEROSPACE LTD		REV. A
HAWKESBURY, ONTARIO, CANADA		SHEET 1 OF 4
DRAWING NO.	D350-748-243	SCALE
TITLE	CROSSTUBE (AS 350/355 HI AFT)	NTS

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**D350-748-243
ASSEMBLY DETAIL**



SECTION A-A D4-2
SCALE 6X

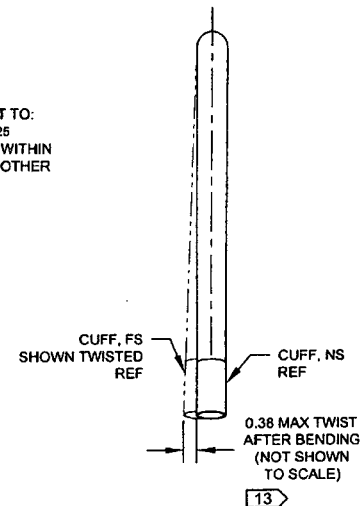
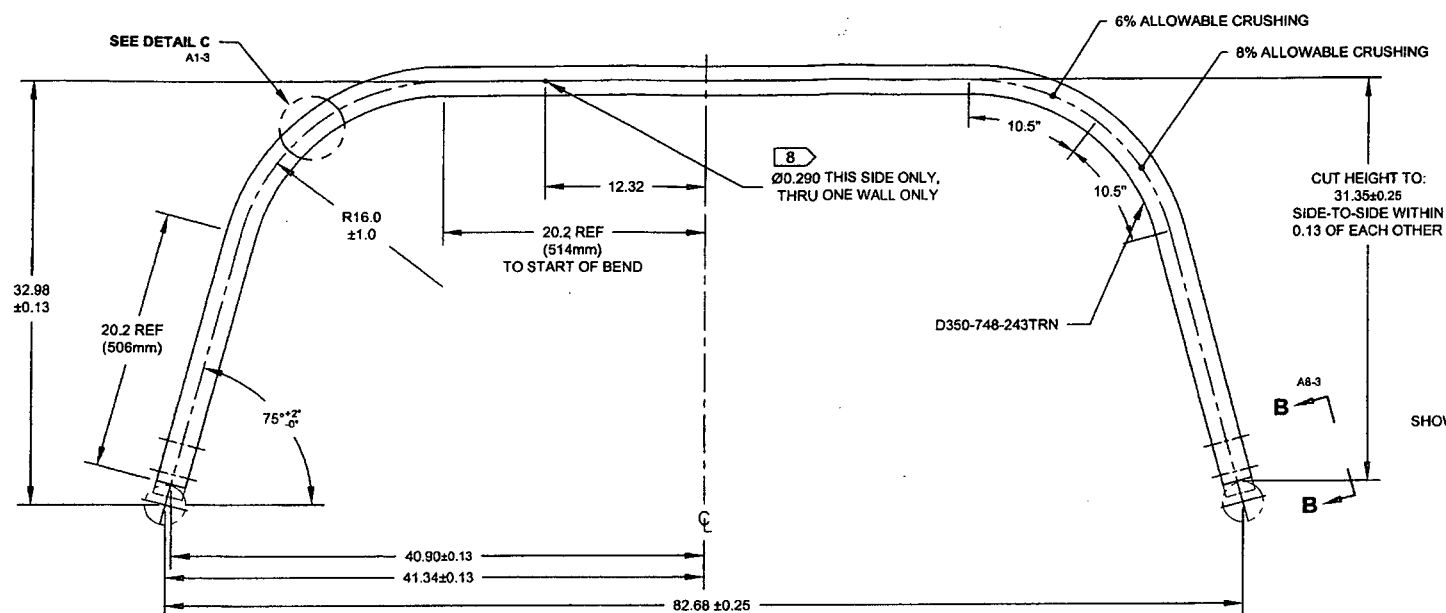
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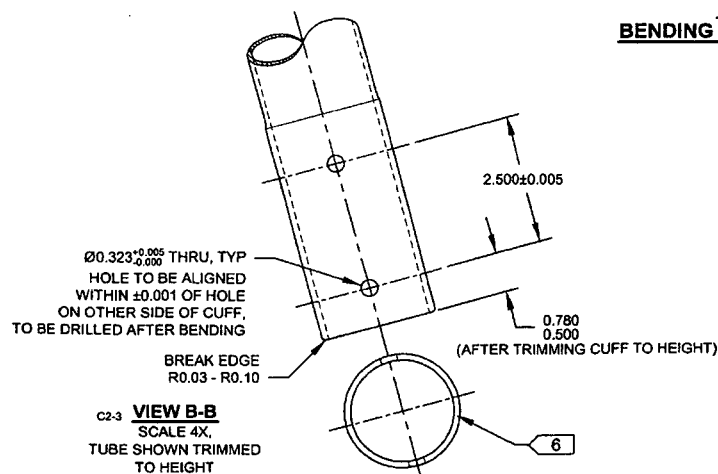
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MFG. APPR.	2.01	D350-748-243	SHEET 2 OF 4
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DE APPR.		CROSSTUBE (AS 350/355 HI AFT)	NTS
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D350-748-243
BENDING AND DRILLING DETAIL 11

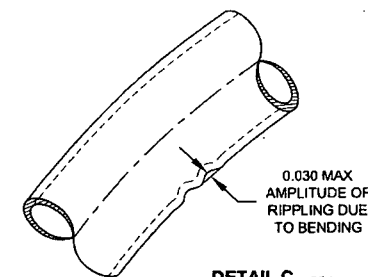


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DETAIL C D7-3
SCALE 4X
RIBBLING EXAGGERATED

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